

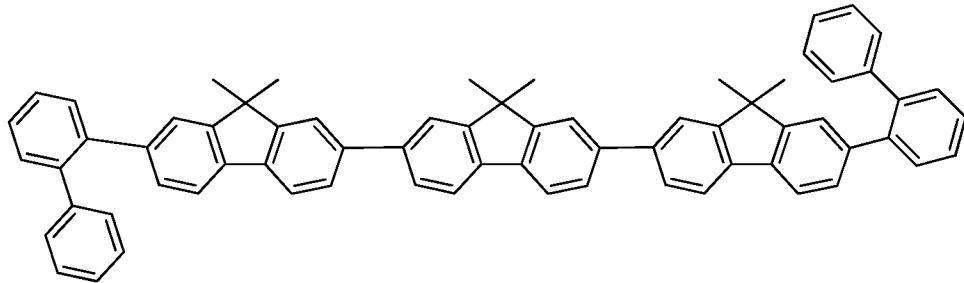
(c) Remarks:

This application has been reviewed in light of the final Office Action dated July 16, 2010. Claim 23 is presented for examination. Claim 23 defines still more clearly what Applicants regard as their invention. Support for new claim 23 may be found in the host material of Examples 2, 139 and 143 and the guest material of Examples 2 and 143. Favorable reconsideration is requested.

Former claims 12, 14-16 and 22 were rejected as obvious over Robello '787 in view of Suzuki WO '372 combined with the Sudhakar article. Claim 21 was rejected as obvious over the same combination of references, further in view of Kawatani '216. The grounds of rejection are respectfully traversed.

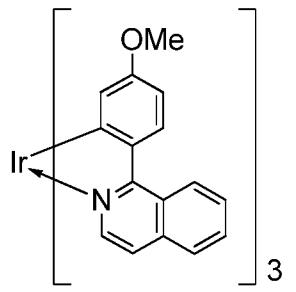
Applicants would like to briefly review certain key features and advantages of the present claimed invention prior to addressing the grounds of rejection.

The present invention has been amended to include an organic electroluminescent device that emits red light. Specifically, the device utilizes

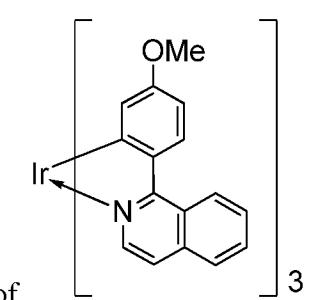
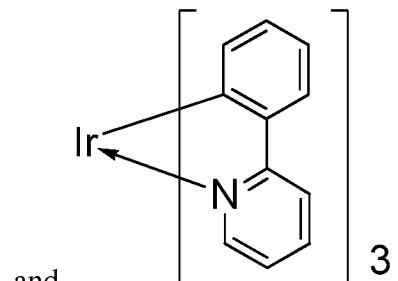
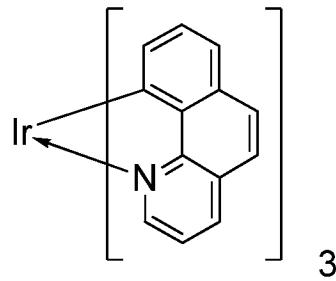


as a host material and the guest materials of Examples 2 and 143.

Examples 2 and 143, supporting the instant claim, each include two kinds of guest materials. In each of Examples 2 and 143, the guest material that emits light is



The remaining guest compounds are:



compounds for assisting the light emission of

It is important that a host material for a layer emitting red phosphorescence has a T₁ (lowest triplet excitation energy level) which is higher than a guest material that provides red color phosphorescence and a S₁ (lowest singlet excitation energy level) which is higher than the T₁ value.

In red color phosphorescence, T₁ is a lower value than the T₁ value for phosphorescence of blue or green, while S₁ for blue or green is higher than that of red color fluorescence. With respect to a guest material which provides red color phosphorescence, a host material has a T₁ that is higher than T₁ of the guest material, so that S₁ becomes higher.

In the host material of the present invention, three fluorene rings are linked in series. This feature provides a host material having a preferred S1 for combination with a guest material that effects red phosphorescence. In other words, this feature provides a host material having a bandgap which is moderately broader (narrower than a bandgap of a light-emitting material that emits light at a high energy such as blue or green) than a guest material that emits red light.

The host material of the present invention has three fluorene rings as a central skeleton and further has biphenyl groups on both sides of the molecule. The biphenyl groups raise, T1 of the host material to be higher than T1 of the guest material which effects red color phosphorescence. Further, experience shows that a biphenyl group is excellent in providing a compound having T1 higher than that of compound with terminal fused polycyclic groups, such as naphthyl.

The guest compound which emits light has a substituent (methoxy), while the assisting material has no substituent. The presence of a substituent permits a higher emission efficiency to be obtained.

While the presence of a substituent on the light-emitting compound provides a higher emission efficiency, nonetheless in such a compound, residual supplied carriers (electrons or holes) are liable to remain in the film formed from the compound. Therefore, an assisting compound, having no substituent which retains carriers, is also present. This reduces the presence of residual carriers.

Essentially, it is preferable that energy and carriers are supplied from the host material to the guest material which provides red color phosphorescence. However, when the assisting compound is present in the guest material, emission efficiency is further

unexpectedly improved. The reason for such improvement is believed to be that the assisting compound has a structure which is different from the host material and the light-emitting guest compound.

When the light-emitting layer is formed of only the host material and the light-emitting guest material, intermolecular stacking between the host material and the guest material is an issue. When an assisting compound, which has a structure different from the host and guest materials is present, then such intermolecular stacking can be suppressed.

With regard to the art rejection, Robello does not disclose three fluorene rings as “A” of the Robello formula. Accordingly, it is unlikely that the host material of Robello can function as a host material for a guest material which provides red phosphorescence. Based on the “A” groups as disclosed in Robello, the resulting compounds do not have a bandgap which is appropriate as a host material with respect to a guest material which provides red phosphorescence. The bandgap of the Robello compounds is too broad to serve as a host material with respect to a light-emitting guest material that provides red phosphorescence.

Further, Robello discloses an iridium complex having phenylisoquinoline as ligands of a guest material that provides red color phosphorescence. However, that guest material is different in structure from the guest material of the present claimed invention. Moreover, Robello neither discloses nor suggests the assisting material of the present claimed invention, nor its advantages.

The defects of Robello are not remedied by Suzuki. Suzuki discloses three fluorene rings linked in series. However, fused polycyclic groups are provided as

substituents on terminals thereof (Ar_1 and Ar_2). Compound 7 of Suzuki has pyrene groups at either end, not biphenyl. Compound 17 of Suzuki has fluoranthene groups at terminal ends, not biphenyl groups. Further, Suzuki discloses providing a green or blue phosphorescence. Suzuki neither discloses nor suggests the relationship between the host material, the guest material and the assisting material of the present invention.

Sudhakar merely teaches a fluorine trimer as a host. No end-terminal ortho-diphenylene groups are substituted thereon. No key relationships between host, guest or assisting compounds are disclosed.

The claims should be allowed and the case passed to issue.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address given below.

Respectfully submitted,

/Peter Saxon/
Peter Saxon
Attorney for Applicants
Registration No. 24,947

FITZPATRICK, CELLA, HARPER & SCINTO
1290 Avenue of the Americas
New York, New York 10104-3800
Facsimile: (212) 218-2200